

# MATERIAL SAFETY DATA SHEET

**SRM Supplier:** National Institute of Standards and Technology  
Standard Reference Materials Program  
Bldg. 202 Rm. 211  
Gaithersburg, Maryland 20899

**SRM Number:** 1879a (Renewals)  
**MSDS Number:** 1879a  
**SRM Name:** Respirable Cristobalite  
(Quantitative X-ray Powder  
Diffraction Standard)  
**Date of Issue:** March 1991  
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## SECTION I. MATERIAL IDENTIFICATION

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**Material Name:** Respirable Cristobalite (Quantitative X-ray Powder Diffraction Standard)

**Description:** This SRM consists of a 5 g unit.

**Other Designations:** cristobalite, crystobalite, *alpha* cristobalite, *alpha* crystobalite, metacristobalite, silica, crystalline cristobalite

**Chemical Formula:** SiO<sub>2</sub>

**CAS Registration:** 14464-46-1

**DOT Classification:** Not hazardous by DOT regulations

**Manufacturer/ Supplier:** Available from a number of suppliers

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## SECTION II. HAZARDOUS INGREDIENTS

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Hazardous Component	Nominal Concentration	Exposure Limits and Toxicity Data
Cristobalite	>95.5 %	OSHA TLV-TWA: 0.05 mg/m <sup>3</sup> (respirable dust)
		ACGIH TLV-TWA: 0.05 mg/m <sup>3</sup> (respirable dust) (Suspected human carcinogen)
		NIOSH Recommended TWA: 50 µg/m <sup>3</sup> for 10 h
		Human, Inhalation: TC <sub>LO</sub> : 400 particles/cm <sup>3</sup> for 4 years (intermittent)
		Rat, Intratracheal: LD <sub>LO</sub> : 200 mg/kg
		Rat, Intraperitoneal: TD <sub>LO</sub> : 90 mg/kg

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**SECTION III. PHYSICAL/ CHEMICAL CHARACTERISTICS**

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Cristobalite	
<b>Appearance and Odor:</b> Colorless cubic or tetragonal crystals	<b>Molecular Weight:</b> 60.09
<b>Specific Gravity:</b> 2.32 g/mL	<b>Boiling Point:</b> 2230 °C
<b>Melting Point:</b> (1708 to 1819) °C	<b>Mohs Hardness:</b> 7
<b>Solubility in Water (vol/vol at 0 °C):</b> Insoluble	<b>Solubility in Other Compounds:</b> Soluble in hydrofluoric acid; very slightly soluble in alkalis

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**SECTION IV. FIRE AND EXPLOSION HAZARD DATA**

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**Flash Point:** N/A**Method Used:** N/A**Autoignition Temperature:** N/A**Flammability Limits in Air (Volume %): UPPER:** N/A**LOWER:** N/A

**Unusual Fire and Explosion Hazards:** This material is a fire hazard when in contact with chlorine trifluoride (ClF<sub>3</sub>), fluorine, manganese trifluoride (MnF<sub>3</sub>), oxygen difluoride (OF<sub>2</sub>) and strong oxidizers.

**Extinguishing Media:** This material is noncombustible. Use extinguishing media that is appropriate to the surrounding fire.

**Special Fire Procedures:** Since the fire may produce toxic fumes, wear a self contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

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**SECTION V. REACTIVITY DATA**

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**Stability:**   X   Stable        Unstable**Conditions to Avoid:** Avoid excessive temperatures.**Incompatibility (Materials to Avoid):** Keep this material from alkalis, hydrofluoric acid, and vinyl acetate.See Section IV: *Fire and Explosion Hazard Data*.**Hazardous Decomposition or Byproducts:** Thermal decomposition may release toxic and/or hazardous gases.**Hazardous Polymerization:**        Will Occur   X   Will Not Occur

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**SECTION VI. HEALTH HAZARD DATA**

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**Route of Entry:**   X   Inhalation   X   Skin   X   Ingestion

**Health Hazards (Acute and Chronic):** Immediate exposure to high concentrations may cause physical discomfort of the upper respiratory tract (URT); contact with the skin can cause irritation due to mechanical abrasion of the dermis. Data of acute eye contact is limited to animal studies. Particles of silica in the range of (2 to 3) micrometers introduced into the *corneal stroma* of rabbit eyes cause little reaction. These same particles introduced into the *anterior chamber* cause an inflammatory reaction in (3 to 5) weeks with the formation of *fibrotic nodules* in the *iridocorneal angle*. Finely divided silica injected into the *vitreous* of the rabbit eyes has caused *necrosis* of the *retina* and *atrophy* of the *choroid*. The effects of ingestion are due to the mechanical action as crystalline silicas are biologically inert.

Chronic exposure by inhalation to high concentrations of finely divided crystalline silica dust, ranging in exposure periods of a few weeks to 4 to 5 years, may cause a rapidly developing *silicosis*, characterized by *pulmonary insufficiency* with severe *dyspnea*, violent coughing, *tachypnea*, weight loss, and *cyanosis* leading to the development of *cor pulmonale* and death within a short period

of time. Many cases are complicated by respiratory infections. Responses to cristobalite appear to be more severe than from quartz, and the *fibrosis* that follows is more progressive than uncomplicated *silicosis*. Studies show that lung cancer occurs more frequently among silicotics (i.e., miners, quarry, foundry, ceramic and granite workers, and stone cutters) than in the general population. While it is still inconclusive at this time, studies indicate that lung cancer may occur.

Chronic exposure to the eye showed an abnormally high silicon content in the *cornea* and a gradual decrease in visual acuity due to *corneal opacities* in the *pupillary* area has been reported in foundry workers who developed *pulmonary silicosis*.

Crystalline silicas are biologically inert, so ingestion poses little difficulties.

**Signs and Symptoms of Exposure:** *Silicosis* is characterized by *pulmonary insufficiency* with progressive *dyspnea*, persistent cough, wheezing, chest pain, progressive impairment of pulmonary function, and diminished chest expansion progressing to marked fatigue, *cyanosis*, weight loss, *pleuratic pain*, and incapacity to work.

**Medical Conditions Generally Aggravated by Exposure:** Respiratory infections. Smoking may increase the risk of injury.

**Listed as a Carcinogen/Potential Carcinogen:**

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	X*	
In the International Agency for Research on Cancer (IARC) Monographs	X**	
By the Occupational Safety and Health Administration (OSHA)		X

\* NTP classifies this material as reasonably anticipated to be a human carcinogen [*silica, crystalline* (respirable size)].

\*\* IARC classifies this material as Group I: Carcinogenic to Humans.

**NOTE:** A significant incidence of malignant *lymphomas* were introduced following intrapleural administration of respirable cristobalite to rats. Epidemiological studies indicate lung cancer occurs more frequently among silicotics than in the general population.

**EMERGENCY AND FIRST AID PROCEDURES:**

**Skin Contact:** Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water until no evidence of the chemical remains. Obtain medical assistance if necessary.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water or normal saline for at least 15 min. Obtain medical assistance if necessary.

**Inhalation:** If inhaled, remove the victim to fresh air. If breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

**Ingestion:** If ingested, wash out mouth with water. If vomiting occurs, keep head lower than the hips to prevent aspiration. Obtain medical assistance.

**TARGET ORGAN(S) OF ATTACK:** Skin, eyes, and URT

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**SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE**

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**Steps to be Taken in Case Material Is Released or Spilled:** Notify safety personnel of major spills and/or leaks. Provide adequate ventilation. Cleanup personnel need protection against eye contact and dust inhalation. Pick up spills, taking care to avoid raising dust clouds (use vacuum or wet sweeping). Place in closed containers for disposal.

**Waste Disposal:** Follow all federal, state, and local regulations.

**Handling and Storage:** Wear protective eyeglasses or chemical safety goggles. Use gloves, aprons, and other protective clothing to prevent skin contact. Protect the skin with barrier creams. Wear a National Institute for Occupational Safety and Health (NIOSH) certified respirator for exposures above the TLV. The specific respirator selected must be based on contamination levels found in the workplace, must not exceed the working limits of the respirator, and must be approved by NIOSH.

Crystalline Silica	
Concentration in Workplace (mg/m <sup>3</sup> )	Type of Respirator*
0.25	N-95 or higher (if no oil in work environment)
0.5	Air purifying respirator with a high efficiency particulate filter
1.25	Any powered, air purifying respirator with a high efficiency particulate filter Supplied air respirator with continuous flow mode
2.5	Air purifying, full facepiece respirator with a high efficiency particulate filter Any powered, air purifying respirator with a tight fitting facepiece and a high efficiency particulate filter
25	Supplied air respirator with pressure-demand or other positive-pressure mode
>25	Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode Any supplied air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in a pressure-demand or other positive-pressure mode

\* NIOSH [1997]. NIOSH pocket guide to chemical hazards, Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 97-140.

Persons handling this material should wear appropriate protective clothing (gloves, lab coats, etc.) and equipment to prevent repeated or prolonged skin contact with this substance. Splash-proof or dust resistant safety goggles should be worn to prevent any eye contact with this material.

**NOTE:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the lab.

Store material in a cool, dry, well-ventilated area away from incompatible materials.

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#### SECTION VIII. SOURCE DATA/ OTHER COMMENTS

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**Sources:** MDL Information Systems, MSDS *Cristobalite*, March 12, 1998.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given only on the NIST Certificate of Analysis.